

REMARKS

The application has been reviewed in light of the Office Action mailed May 20, 2004. Claims 5, 7 and 8 have been amended without adding new matter. Claims 1-4, 10-17, 42-46 and 48-57 are pending.

Claims 1-4 and 10-17 stand rejected under 35 U.S.C. § 102 as being anticipated by Mess et al., U.S. Patent Application Publication No. 2003/0137042 (hereinafter "Mess"). This rejected is respectfully traversed for the following reasons.

Claim 1 of the invention recites a wire bonded structure comprising a "first wire bond between said first and said second bonding areas; a second wire bond between said second and said third bonding areas, wherein a bump is at one end of each of said first and second wire bonds." Claim 1 further provides for "at least one of said first and second wire bonds at said second bonding area being on top of the other of said first and second wire bond at said second bonding area, and wherein one of said bumps is formed on said second bonding area in electrical communication with said first and second wire bonds."

Mess fails to teach or suggest the above-quoted limitations of claim 1. Initially, Mess fails to teach or suggest "at least one of said first and second wire bonds at said second bonding area being on top of the other of said first and second wire bond at said second bonding area." As seen in Figure 14, all of the wires in Mess run to and from individual bond pads. Thus, Mess fails to teach or suggest this limitation, and the Office Action does not contend to the contrary. Claim 1 is allowable over Mess for at least this reason.

Further, Mess fails to teach or suggest that a "bump is at one end of each of said first and second wire bonds." Although the Office Action asserts that "[b]umps (ball bonds) are formed on at least one pad (paragraphs 57-60)," such is not the case. Whereas Mess discloses in the cited paragraphs a method of "ultrasonic ball bonding" (paragraph 60), Mess fails to teach or suggest a structure having a "bump" at an end of a wire bond. A "bump" is not a "ball bond," as suggested by the Office Action. See, for example, page

7, line 20 to page 8, line 11 of the specification for a discussion of “bumps” in wire bonding. The claimed invention is not limited to the preferred embodiments. This is an additional reason for allowance of claim 1 over Mess.

For at least these reasons, claim 1 is allowable over Mess. Claims 2-4 and 10-13 depend from claim 1 and contain every limitation of claim 1. Claims 2-4 and 10-13 are allowable for at least the same reasons as for allowance of claim 1, and for other reasons.

Claim 14 recites a “first wire bond formed from a bonding pad of said substrate to a bonding pad of said lower chip; a second wire bond formed from said bonding pad of said lower chip to a bonding pad of said upper chip and electrically connected to said first wire bond.” Claim 14 further recites that “said first wire bond and said second wire bond are configured such that an imaginary line drawn between endpoints of said first wire bond and an imaginary line drawn between endpoints of said second wire bond are not parallel.”

Mess fails to teach or suggest these limitations. Regarding these limitations, the Office Action asserts that “[a]ngles are formed in the vertical and horizontal planes (figures 13 and 14.” Office Action, page 2. However, with reference to the cited Figures of Mess, and in particular to Figure 14, it is apparent that there is no “second wire bond formed from said bonding pad of said lower chip to a bonding pad of said upper chip.” In Mess’ structure, as illustrated in Figure 14, there is no wire bond between die 60A (“lower chip”) and die 60B (“upper chip”). Moreover, with reference to Figure 14, there is no teaching that the “second wire bond [is] electrically connected to said first wire bond.” All of the wires in Mess run to and from individual bond pads.

Thus, Mess fails to teach or suggest all of the limitations of claim 14 and claim 14 is allowable for at least these reasons. Claims 15-17 depend from claim 14 and contain every limitation of claim 14. Claims 15-17 are allowable for at least the same reasons as for allowance of claims 15-17, and for other reasons.

Claims 14-17 stand rejected under 35 U.S.C. § 102 as being anticipated by O'Connor et al., U.S. Patent No. 6,476,506 (hereinafter "O'Connor"). Reconsideration is respectfully requested for the following reasons.

Claim 14 specifically recites that "said first wire bond and said second wire bond are configured such that an imaginary line drawn between endpoints of said first wire bond and an imaginary line drawn between endpoints of said second wire bond are not parallel." This claimed feature is made possible by the off stitch bonding technique disclosed in the specification. See, for example, Figures 5B and 6, and page 8, line 18 through page 9, line 10 of the specification for an illustrative explanation of the claimed features. The claimed invention is not limited to the disclosed embodiments.

O'Connor fails to teach or suggest this limitation. Although the Office Action broadly asserts that "[a]ngles are formed in the vertical and horizontal planes ... (figures 4 and 6 and col 5 line 44 – col 6 line 19)" (Office Action, page 3), such is not the case. Figure 4 of O'Connor shows only the profiles of the wire bonds 142, 144, and does not show the claimed features. And, Figure 6 of O'Connor is shown "without the wire bonds" (col. 6, ll. 37-38), and thus does not teach or suggest the claimed features. Moreover, Figure 6 shows bond pads only on the substrate 14 and upper die 12, and thus cannot teach or suggest "first wire bond formed from a bonding pad of said substrate to a bonding pad of said lower chip; a second wire bond formed from said bonding pad of said lower chip to a bonding pad of said upper chip and electrically connected to said first wire bond," as recited in claim 14.

For at least these reasons, claim 14 is allowable over O'Connor. Claims 15-17 depend from claim 14 and are allowable for the same reasons as for allowance of claim 14, and for other reasons. For example, claim 17 recites that an "intersection between said imaginary lines forms an angle in horizontal and vertical planes." O'Connor fails to teach or suggest these limitations, nor does the Office Action contend to the contrary, and this is an additional reason why claim 17 is allowable.

Claims 42-46 and 48-57 stand rejected under 35 U.S.C. § 102 as being anticipated by the Biggs, Fujushima, Nagaoka and Yin references, already of record. The reasoning behind these rejections is restated from the previous Office Action, mailed on December 4, 2003. The Applicants traverse these rejections for the reasons set forth in the Amendment filed on March 4, 2004, which is incorporated by reference herein.

In the “Response to Arguments” section, the Office Action asserts that “[r]egarding applicant’s argument that [the references] do not teach an apparatus ... because the device does not form the bumps it is not capable of forming bumps, it is noted that the claims in question are apparatus claims rather than method claims.” Office Action, page 5. The Office Action also adds that “a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior structure is capable of performing the intended use, then it meets the claim.” Office Action, pages 5-6 (emphasis added).

The above-highlighted portion of the Office Action’s rejection underscores why it is insufficient. As the Applicants explained in the Amendment filed on March 4, 2004, the cited references are not capable performing like the claimed apparatus. Moreover, the claims are not directed toward an “intended use,” but toward an apparatus which produces the recited structure.

For example, regarding independent claim 42, the Applicants explained that the Biggs reference does not teach or suggest that its tool comprises “a mechanism ... that ... forms a first wire bond from a first surface to a second surface, and forms a second wire bond from said second surface to a third surface, wherein said first and second wire bonds are electrically connected on said second surface, and wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane,” as recited in claim 42.

Regarding the Fujushima reference, the Applicants explained that the Office Action failed to explain how the Fujishima device could perform each and every limitation recited in claim 42. Regarding the Nagaoka reference, the Applicants explained that it does not teach or suggest a device for forming two wire bonds, which are formed at an angle in a horizontal plane, as claimed in claim 42. And, regarding the Yin reference, the Applicants explained that Yin fails to teach or suggest a device that “forms a first wire bond ... [and] a second wire bond ... wherein said first and second wire bonds are electrically connected on said second surface, and wherein said second wire bond is formed at an angle with respect to said first wire bond in a horizontal plane,” as recited in claim 42.

The Office Action failed to address the Applicants’ arguments, and failed to explain how each and every element of the claims is met by the references. The Office Action “supports” the rejections only by a conclusory statement that “[i]t is noted that the devices have the claimed structures ... which [are] movable in several direction and controller for controlling a wire bonding device such that bumps can be formed The device is capable of forming ball bonds and bumps at various angles.” Office Action, page 6. This is a mere conclusion. The Office Action does not explain where in each reference can be found a teaching that could meet each and every limitation of the rejected claims. Moreover, the Office Action fails to respond the Applicants’ arguments. For these reasons, claims 42-46 and 48-57 are allowable.

Applicants acknowledge with appreciation the indication that claims 6-8 and 18-41 are allowed, and that claim 5 would be allowable if rewritten in independent form to include the limitations of its base claim. Claim 5 has been amended to include all of the limitations of its base claim 1, and is considered to be in condition for allowance.

Regarding allowed claims 7 and 8, Applicants note that claim 7 depends from rejected claims 1 and 3, and claim 8 depends from rejected claim 1. Applicants have amended claims 7 and 8 to include the limitations of their base and intervening claims, and, thus, claims 7 and 8 are in condition for allowance.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Dated: August 19, 2004

Respectfully submitted,

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